REMARKS

Claims 1-31 are pending and have been rejected. Claims 1, 15, 17 and 18 have been revised for clarity. Claim 15 recites a tuned multicolor OLED device having a plurality of different microcavity structures and a common emitting layer producing multiple wavelength of light. Claims 27-31 are canceled and claims 1-26 are presented for further examination and consideration.

Claim 1 sets forth a single color tuned OLED device. It is representative of the claims in the case. Claims 15, the other independent claim is directed to producing different color light for different pixels. Claim 1 emphasizes that a tuned OLED as recited in the preamble is one that has a tuned microcavity structure. The tuned microcavity structure enhances a particular wavelength of light provided by the light emitting layer.

Applicants would like to thank Examiner Williams and Examiner Dong for the courteous interview of November 15, 2005. During the interview, the special problems presented by tuned microcavity devices were discussed with reference to Figure 1, a cross-sectional view of a prior art tuned OLED device showing the effect of light emission in a microcavity. It was explained that light 115 in Figure 1 is on-axis light that is produced from a light-emitting layer in the direction of a semitransparent reflector and is partially reflected as partially reflected light 120, and partially transmitted as partially transmitted on-axis light 125. The partially transmitted on-axis light 125 includes one or more narrow wavelength bands of light, and thus is tuned, *i.e.*, microcavity structure 70 enhances on-axis light produced from a light-emitting layer in at least one particular wavelength of on-axis light to produce a desired on-axis viewed color while not substantially enhancing other wavelengths of such light. Light 105 represents on-axis light that is emitted in the direction of a reflector layer and is reflected as reflected light 110. It will be partially reflected and partially transmitted at the semitransparent reflector.

Light 135 represents light that is produced in an off-axis direction in a tuned microcavity device. It can be partially reflected by the semitransparent reflector as partially reflected light 130, and partially transmitted as partially transmitted off-axis light 140. Light emitted in an off-axis direction by a microcavity structure, *e.g.* partially transmitted off-axis light 140, will have a different wavelength and luminance than light emitted on-axis, *e.g.* partially transmitted on-axis light 125. In other words, the microcavity structure will produce

light having a broad spectrum, which can be seen at different viewing angles, even if the microcavity is tuned to enhance a single wavelength of on-axis viewed color. Typically, microcavity light emitted off-axis will have a shorter wavelength than light emitted on-axis. [1]

The present invention solves the problem of off-axis light having a color that is different than the color of the on-axis light. An OLED device according to the invention is shown in Figure 3, and further includes a layer including a color change medium 25. The color change medium layer is disposed over the semitransparent reflector. The color change medium is responsive to wavelengths of light shorter than the particular wavelength of on-axis light. The color change medium absorbs such shorter wavelengths (*e.g.* partially transmitted off-axis light 140) and emits light (*e.g.* converted light 150) corresponding in color to the particular wavelength of partially transmitted on-axis light 125. By corresponding in color, it is meant that it is in the same region of the visible spectrum and will be perceived by a viewer as similar or the same in color. For example, the particular wavelength of on-axis light of tuned OLED device 15 can be in the green portion of the spectrum. Partially transmitted on-axis light 125 will include a narrow distribution of wavelengths that will be perceived by a viewer as green. Partially transmitted off-axis light 140 will be more blue than partially transmitted on-axis light 125, but will be absorbed by the color change medium and re-emitted as converted light 150. Converted light 150 can include a broader distribution of wavelengths than partially transmitted light 125, but will be in the same general portion of the visible spectrum as partially transmitted light 125 and will also be perceived by a viewer as green light. [2]

Claims 1-4, 6-8, 10-19, 21-23 and 25-31 are rejected under 35 USC § 103(a) as being unpatentable over Applicant's Admitted prior art in view of U.S. Patent No. 6,873,093 to Yu *et al.* Claims 5 and 20 are rejected under 35 USC § 103(a) as being unpatentable over Applicant's Admitted prior art in view of U.S. Patent No. 6,873,093 to Yu and in further view of U.S. Patent No. 6,309,486 to Kawaguchi. Claims 9 and 24 are rejected under 35 USC § 103(a) as being unpatentable over Applicant's Admitted prior art in view of U.S. Patent No. 6,873,093 to Yu and in further view of U.S. Patent No. 6,281,634 to Yokoyama.

[1] Specification at pages 4 through 5.
[2] Specification at page 7.

At the interview it was explained that Yu *et al.* does not have a microcavity structure, and thus cannot provide any useful information to the skilled artisan of how to solve the problem of off-axis light that has a different color than the on-axis light in a tuned OLED as presently claimed. Yu *et al.* uses conventional techniques for producing different color pixels. In one embodiment in Yu *et al.*, they have a common blue light emitting layer and in two of their pixels they have two different color media. More particularly, a display structure 300 in Yu *et al.* comprises three sets of organic light emitting diodes (OLEDs) that form a portion of a display. The OLEDs in all three sets are blue OLEDS 310. The blue light 345 from each of the OLEDs 310 is emitted through a transparent electrode 224 on the front side of the blue OLEDs 310 towards a front of the display. The blue light enters a color changing layer 365 comprising two sets of color changing areas. A blue-to-green conversion area 317 is a member of one of the two sets of color changing areas and a blue-to-red conversion area 322 is a member of the other of the two sets of color changing areas These color changing areas comprise materials that down convert the wavelengths in the band of the blue light to wavelengths that generate a band of green light or red light.

There is no suggestion of any problem with off-axis light, and the primary reason for this is that Yu *et al.* do not have a microcavity structure. The off-axis light problem is particularly found in microcavity devices. Another reason that Yu *et al.* does not have the off-axis light problem is that the light emitting layer of Yu *et al.* produces light having only one color.

Claim 1 recites an OLED device tuned microcavity structure which enhances on-axis light produced from the light-emitting layer in at least one *particular wavelength* to produce a desired on-axis viewed color while not substantially enhancing on-axis other wavelengths of such light. Claim 1 further recites that the OLED device includes a layer with a color change medium which is responsive to wavelengths of light shorter than *the particular wavelength* by absorbing such shorter wavelengths of light and emitting light corresponding in color to *the particular wavelength*, thereby improving the color of the light produced by the OLED device when viewed in an off-axis direction.

Attempting to apply this recitation in claim 1 to the teaching in Yu *et al.*, blue would have to be taken as the "particular wavelength" of the "on-axis viewed color" (realizing, of course, that Yu *et al.* is not a tuned microcavity device and hence any discussion of an on-

axis viewed color is somewhat misleading, at best). Then the color change media of Yu *et al.* absorb the light of "the particular wavelength," in this case blue. However, the color change media in Yu *et al.* do not emit "light corresponding in color to the particular wavelength," as specified in applicant's claims. Instead, they emit light having wavelengths in either the green or red region of the spectrum, respectively. Applicant's claims would require a color change medium that would absorb wavelengths shorter than blue emitted by the common emissive layer in Yu *et al.*, *i.e.*, ultraviolet, and emit the color *blue*, not red or green as in Yu *et al.*

Yu *et al.* further disclose that in areas where blue pixels are desired, layer 365 can either be transparent or can include a blue band pass filter. Yu *et al.* clearly distinguish, in column 5, lines 21-38, between materials that down convert, which are used in those areas where blue light is to be converted to red or green, and filters, which optionally can be used in the blue regions. It is to be noted that applicant draws a similar distinction between color change media and filters, stating that "While not required, tuned OLED device 15 can further include color filter 85. Color filter 85 can be any well known filter and is designed to remove any light of a shorter wavelength than the particular wavelength of on-axis light that was not absorbed by color change medium 25 or any light of a longer wavelength than the particular wavelength of on-axis light."[3] Thus, there is no suggestion in Yu *et al.* of a color change medium as presently that absorbs wavelengths shorter than a particular wavelength of tuned light and emits light corresponding in color to the particular wavelength of the tuned light.[4]

The color change material in the present invention is only directed at off-axis light emitted from the microcavity structure which has a lower wavelength than the on-axis light. Therefore, the color change medium does not interact with the on-axis light, as is the case in Yu *et al.* There is no motivation in either Yu *et al.* or any other art of record for using a color change medium in a conventional microcavity structure to correct the problem of the color of off-axis light. Yu *et al.* does not have a problem with off-axis light and thus can provide no teaching that is relevant to solving the problem in a microcavity structure as set forth in the claims in the present case. In effect, the Examiner is using the teachings from the present

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[3] Specification at page 9, lines 11-15.
[4] As noted above, the converted light 150 actually can include a broader distribution of wavelengths than the particular wavelength of on-axis light 125, but will be in the same general portion of the visible spectrum as this light, and will be perceived by a viewer as being of the same color as the on-axis light.

invention against itself, since there is nothing in the prior art that suggests the present invention.

Claim 15 includes the features of claim 1 but addresses producing at least two different color pixels. The claim as been clarified by reciting a common light emitting layer and at least two different microcavity structures. The common emitting layer produces different color light for the two different microcavity structures. The emitting layer of Yu *et al.* only produces blue light. All other colored light is produced by the color change media in Yu *et al.*

In view of foregoing, it is believed that none of the references, taken singly or in combination, disclose the subject matter of either independent claim 1 or independent claim 15, and that these claims define unobvious subject matter. The remaining claims depend on either claims 1 or 15 and should be allowed with them. It is believed that these changes now make the claims clear and definite. Accordingly, this application is believed to be in condition for allowance, the notice of which is respectfully requested. If there are any remaining problems that need to be addressed, Applicants' attorney would appreciate a telephone call at the exchange listed below.

Respectfully submitted,

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If the Examiner is unable to reach the Applicant(s) Attorney at the telephone number provided, the Examiner is requested to communicate with Eastman Kodak Company Patent Operations at (585) 477-4656.